APD-PRIM
Pulse Processing Unit and
APD Head 5 x 5 mm^2

Operating & Service Manual

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2. Introduction

This manual details the specification and operating requirements for the IC-Prim electronics module and detector head APD0002

ATTENTION

- Before operation fully read and understand the manuals. If there is anything you do not understand contact FMB Oxford / third party supplier before use.
- This product should only be used by those persons legally permitted to do so

2.1.1 Important Health and Safety Notice

When returning components for service or repair, it is essential that the item is shipped together with a signed declaration that the product has not been exposed to any hazardous contamination, or that appropriate decontamination procedures have been carried out so that the product is safe to handle.

2.1.2 Feedback

Care has been taken to ensure the information in this manual is accurate and at an appropriate level. Please inform FMB Oxford if you have any suggestions for corrections or improvements to this manual.

2.1.3 Trademarks

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3. Warranty

2.1 FMB OXFORD warrants that the Equipment shall be free from defects by reason of faulty design, workmanship or materials and that if within the guarantee period set out in sub-clause 3 the Equipment proves defective for such reason FMB OXFORD shall adjust, repair or replace it as it sees fit free of charge, provided that:

2.1.1 The Equipment has been used solely for the purpose for which FMB OXFORD understands it is to be used and in accordance with the operating instructions;

2.1.2 The defect has not been caused by fire, accident, misuse, neglect, incorrect installation by the customer, its customers, agents or servants or unauthorised repair or maintenance or by use of sub-standard consumables;

2.1.3 The defect has not arisen from any design, specification, component or material supplied by the customer;

2.1.4 No part of the Equipment has been replaced with a part not supplied by FMB OXFORD or approved as suitable by it;

2.1.5 Payment in full of all sums due in respect of the Equipment has been made;

2.1.6 The customer shall be liable for any costs incurred by FMB OXFORD in responding to claims made in respect of erroneous results caused by operator error or incorrect application;

2.1.7 Upon the customer making a claim under sub-clause 1 it shall accord sufficient access to the Equipment to enable FMB OXFORD staff to inspect and adjust, repair, remove or replace the Equipment;

2.1.8 FMB OXFORD will co-operate with the customer in the assessment of reported defects but the final decision regarding the applicability of this guarantee shall rest with FMB OXFORD.

2.2 FMB OXFORD shall decide if the Equipment should be repaired pursuant to sub-clause 1 at its site or returned.

2.3 The applicable guarantee period shall be 12 months after delivery save where the Equipment is installed and/or commissioned by or under the supervision of FMB OXFORD in which case it shall be 12 months from the date of the installation certificate or 18 months after the date of delivery, whichever is the earlier.

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4. Health and Safety Information

4.1 General

In normal operation, the system is designed to operate safely. The user should, however, be aware of potential hazards which exist in and around equipment of this type and of the ways of avoiding possible injury and equipment damage which may result from inappropriate ways of working. A description of such potential hazards and how to avoid them is given in this section.

If the equipment is used in a manner not specified in the User Manual, the protection provided by the equipment may be impaired.

This manual adopts the following convention:

ATTENTION

- Indicates important information that must be adhered to

WARNING

- Indicates a potential hazard which may result in injury or death

CAUTION

- Indicates a potential hazard, which may result in damage/injury to equipment or user

Do not take risks. You have a responsibility to ensure the safe condition and safe operation of equipment.

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4.2 Potential Electrical Hazards

The following list is not intended as a complete guide to all the electrical hazards on the system, but illustrates the range of potential hazards that exist:

WARNING

- Electrical shock
- Electrical burn
- Fire of electrical origin
- Electrical arcing particularly at partial vacuum

4.3 Electrical Precautions

WARNING

- Ensure that all electrical equipment is properly grounded.
- Conform to all local and national electrical regulations.
- Ensure that the mains supply is properly fused and can be isolated locally via a clearly labeled, visible and easily accessible isolating switch.
- Isolate the supply before carrying out any maintenance work.
- Do not defeat interlocks, remove connectors, disconnect equipment, open safety covers, dismantle or modify equipment unless qualified and authorized to do so.

CAUTION

- Only personnel who are qualified and authorized to work with the voltages and currents used by this equipment and are fully conversant with its operation and potential hazards may disconnect, open, dismantle, service or modify the equipment.

4.4 *Moving Parts*

CAUTION

- Keep clothing and body parts away from moving mechanisms

4.5 *X-Ray Radiation*

This equipment is intended for use on an X-ray beamline of a synchrotron.

CAUTION

- Ensure that all facility safe working practice and procedures are followed

The manufacturer does not accept and liability for personnel injury or damage resulting from ionising radiation

4.6 Modifications and service

The safety, reliability or performance of the equipment may be impaired if assembly operations, extensions, re-adjustments, modifications or repairs are not carried out in accordance with the instructions provided in this manual and with any other instructions issued by the manufacturer. If you wish to modify the equipment please contact FMB Oxford for further advice

ATTENTION

It should be stressed that those parts of the equipment which are interchangeable, and which are subject to deterioration during operation, may significantly affect the safety of the equipment

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5. Overview

The detection system consists in an APD head and a pulse processing unit.

The APD head features a 5x5 mm avalanche photodiode and a multi-staged high speed amplifier.

The pulse processing unit supplies the bias voltage for the APD head and a constant fraction discriminator



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6. Pulse Processing Unit

CAUTION

- **LETHAL VOLTAGE PRESENT INSIDE DEVICE WHEN OPERATED: 400 VOLTS MAXIMUM HIGH VOLTAGE SUPPLY**
- **USER MUST DISCONNECT DEVICE BEFORE OPENING HOUSING FOR ANY REASON**
- Please note that permanent damage to the APD head can occur if rated High Voltage supply value (above) is exceeded.

CAUTION

Disturbing ground loops warning : In order to avoid unwanted effects, the body of the APD Head should always be electrically ***isolated*** from the experiment where it is installed

ATTENTION

Shielding ground warning : In order to obtain the best signal shielding, the body of the APD Head must always be electrically ***connected*** to the ground of the pulse processing electronics used .

6.1 Dimensions

- External 221.6 x 34.15 5U

6.2 Constant fraction discriminator

• Input impedance	50 Ohm
• Timing resolution	~60 pSec. (FWHM)
• Input thresholds lower and upper level	0 - -2.5V
• Fixed input delay	t_d = 2 nSec., t_d>2/3 x t_r for true constant fraction
• TTL ouput into 50 Ohm	- rise time 2.2 nSec. - fall time 3.5 nSec. - width (FWHM) 6.2 nSec. - maximum rate ~100 MHz

6.3 High Voltage Supply

• Output voltage	Adjustable between 0 V and +420 V
• Output current max	3 mA
• Ripple	HF (> 5 KHz) -> 1 mV$_{p-p}$ LF (5 KHz) -> 4 mV$_{p-p}$
• Monitor Voltage & Current	0 to +10 V, ±2.5% accuracy
• Current limit	120 % of maximum output current
• Protection	Short circuit and arc protected
• Input voltage	+24V 10%
• Input current	300 mA
• Temperature Operating	Operating -> -10 to 50 °C Storage -> -20 to 70 °C
• Thermal drift	Typical -> 20 ppm/°C Maximum -> 50 ppm/°C

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The APD Head is protected over high current consumption

When the bias voltage current exceeds the overcurrent threshold the bias voltage is switched off, the I TRIP red LED is LIT.

Hence adjust the bias voltage (V MON. potentiometer) or the over current threshold (I TRIP potentiometer) and apply bias voltage (V TRIP RES. Push button)

6.4 Current Consumption of NIM version

- 300 mA maximum on the + 24 V line
- 120 mA on the - 24 V line
- 330 mA on the + 12 V line
- 90 mA on the - 12 V line

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7. Front Panel

7.1 Front panel description

- I TRIP red LED lit : over current detected,

  bias high voltage switched off.

ATTENTION

When starting up the red LED lit due to initialisation. Press the I TRIP RESET button to switch on power supply.

V TRIP RES. push button : apply bias high voltage.

- I MON. current monitor :

  I_{mon} 0-3 mA, 0-10V ouput

- I TRIP overcurrent threshold adjustment potentiometer :

  I_{max} 0-30µA, 0-0.12V output

  factory setting 50 mV (12.5 µA)

- V MON. bias voltage adjustment potentiometer :

  HV 0-420V, 0-7V output

- UL VARIABLE/FIXED Discrimination selection switch :

  VARIABLE : window mode

  FIXED : integration mode

- TRIGGER green LED : trigger On / Off
- GND ground
- UL upper level threshold adjustment potentiometer :

  ULT 0 to –2.5 V, 0 to –2.5 V output

- LL lower level threshold adjustment potentiometer :

  LLT 0 to –2.5 V, 0 to –2.5 V output

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